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## Canadian Patents Database

03/29/2002 - 14:15:22

Patent Document Number 1166374 :

PROPELLANT-ACTIVE CARRIER SYSTEM FOR WATER-BASED PAINTS

AGENT PROPULSIF POUR PEINTURES AQUEUSES EN AEROSOL

### CLAIMS:

15 The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A single phase liquid propellant-solvent composition suitable for use in the spray application of an active ingredient from a pressurized container onto a substrate surface, consisting essentially of:
  - (a) about 20 to about 75% by weight of dimethyl ether;
  - (b) about 10 to about 50% by weight of water;
  - (c) about 1 to about 30% by weight of at least one aliphatic monohydric alcohol of the formula: R-OH wherein R is an unsubstituted straight or branched chain alkyl group containing from 1 to 6 carbon atoms, and
  - (d) about 1 to about 15% by weight of at least one coalescing solvent,said composition exerting a vapor pressure within said pressurized container in the range of about 30 to about 85 psig at 70°F.
2. The composition of claim 1 wherein said monohydric alcohol is ethanol or isopropanol.
3. The composition of claim 1 wherein said coalescing solvent is selected from the group consisting of lower monoalkyl esters of ethylene or propylene glycol, diacetone alcohol and ester alcohols.
4. A water-based aerosol paint composition suitable for spray application from a pressurized container to a substrate surface and air drying to a continuous film thereon, said composition comprising:
  - (a) about 6 to about 25% by weight of at least one water-dilutable film-forming polymer, and



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## Canadian Patents Database

03/29/2002 - 14:15:47

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(11) **CA 1166374**

Application Number:

(21) **361946**

(54) PROPELLANT-ACTIVE CARRIER SYSTEM FOR WATER-BASED PAINTS

(54) AGENT PROPULSIF POUR PEINTURES AQUEUSES EN AEROSOL

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### ABSTRACT:

ABSTRACT OF THE DISCLOSURE A single phase solvent-propellant composition using dimethyl ether, water, aliphatic alcohol and coalescing solvent is used to provide aerosol water-based paint compositions based on a variety of film-forming polymers.

CLAIMS: [Show all claims](#)

(b) about 92 to about % by weight of the solvent-propellant composition of claim 1.

5. The composition of claim 4 wherein said film-forming polymer is present in an amount of from about 12 to about

20% by weight and said solvent-propellant composition is present in an amount of about 88 to about 80% by weight.

6. An aerosol water-based paint composition having a pH of about 7.2 to about 10 and suitable for spray application to a substrate surface and air drying to a continuous film thereon, consisting essentially of:

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(a) about 6 to about 25 wt.% of at least one water-dilutable film-forming polymer,  
(b) about 20 to about 60 wt.% of dimethyl ether,  
(c) about 10 to about 40 wt.% of water,  
(d) about 1 to about 20 wt.% of at least one aliphatic monohydric alcohol of the formula: R-OH wherein R is an unsubstituted straight or branched chain alkyl group containing from 1 to 6 carbon atoms,  
(e) about 1 to about 10 wt.% of at least one coalescing solvent,  
(f) 0 to about 3 wt.% of at least one surfactant,  
(g) 0 to about 15 wt.% of at least one pigment,  
(h) 0 to about 1 wt.% of at least one pH stabilizer,  
(i) 0 to about 2 wt.% of at least one antifoam agent, and  
(j) 0 to about 2 wt.% of at least one plasticizer, said dimethyl ether, water, monohydric alcohol and coalescing solvent being present in proportions to provide a single phase solvent-propellant composition in which the remainder of the components of the composition are dissolved or suspended, said composition exerting a vapor pressure within said pressurized container in the range of about 30 to about 85 psig at 70°F.

7. The composition of claim 6 wherein said dimethyl ether is present in an amount of about 20 to about 40 % by weight.

8. The composition of claim 6 wherein said water is present in an amount of about 20 to about 35 % by weight.

9. The composition of claim 6 wherein said monohydric alcohol is present in an amount of about 5 to about 20 % by weight.

10. The composition of claim 6 wherein said coalescing solvent is present in an amount of about 5 to about 10 % by weight.

11. The composition of claim 6 wherein:  
said dimethyl ether is present in an amount of about to about 40 % by weight,  
said water is present in an amount of about 20 to

17 about 35 % by weight,  
said monohydric alcohol is present in an amount of about 5 to about 20 % by weight, and  
said coalescing solvent is present in an amount of about 5 to about 10% by weight.

12. The composition of claim 6 wherein said pH is about

7.4 to about 7.9.

13. The composition of claim 6 wherein said continuous film is pigmented and said at least one pigment is present in said composition in an amount of about 5 to about 15 wt. %.

14. The composition of claim 6, 11 or 13 wherein said film-forming polymer is a water-soluble resin which is dissolved in said solvent-propellant composition.

15. The composition of claim 6, 11 or 13 wherein said film-forming polymer is a water-dilutable resin.

16. The composition of claim 6, 11 or 13 wherein said film-forming polymer is selected from the group consisting of acrylic resins, alkyds, epoxy esters and polyvinyl copolymers.

17. The composition of claim 6 or 11 wherein said monohydric alcohol is ethanol or isopropanol.

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#### CLAIMS SUPPORTED BY SUPPLEMENTARY DISCLOSURE

18. A single phase liquid propellant-active carrier composition suitable for the spray application of an active ingredient from a pressurized container onto a substrate surface, consisting essentially of:

- (a) about 20 to about 75% by weight of a propellant comprising dimethyl ether and from 0 to about 50% by weight of the dimethyl ether of another liquid propellant;
- (b) about 10 to about 50% by weight of water; and
- (c) about 0.1 to about 45% by weight of at least one polar water-soluble organic solvent, said propellant, water and polar organic solvent totalling 100% by weight and said composition, together with any gaseous propellant present, exerting a vapor pressure within said pressurized container in the range of about 30 to about 85 psig at 70°F.

19. The composition of claim 18 wherein said polar organic solvent comprises at least one aliphatic monohydric alcohol of the formula: R-OH in which R is an unsubstituted straight or branched chain alkyl group containing from 1 to 6 carbon atoms.

20. The composition of claim 18 wherein said polar organic solvent is selected from the group consisting of lower mono alkyl esters of ethylene or propylene glycol, diacetone alcohol, ketones and ester alcohols.

21. The composition of claim 18 wherein said polar organic solvent comprises a mixture of at least one aliphatic monohydric alcohol of the formula: R-OH in which R is an unsubstituted straight or branched chain alkyl group containing from 1 to 6 carbon atoms and a different water-soluble polar organic solvent.

22. A water-based aerosol paint composition suitable for spray application from a pressurized container to a substrate surface and air drying to a continuous film thereon, said composition comprising:

- (a) about 6 to about 25% by weight of at least one water-dilutable film-forming

polymer, and

(b) about 92 to about 95% by weight of the propellant-active carrier composition of claim 18.

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23. The composition of claim 22 wherein said film-forming polymer is present in an amount of from about 12 to about 20% by weight and said propellant-active carrier composition is present in an amount of about 88 to about 80% by weight.

24. An aerosol water-based composition having a pH of about 7.2 to 10 and suitable for spray application to a substrate surface and air drying to a continuous film thereon, consisting essentially of:

(a) about 6 to about 25 wt.% of at least one waterdilutable film-forming polymer,

(b) about 20 to about 60 wt.% of a propellant comprising dimethyl ether and from 0 to about 50 wt.% of the dimethyl ether of another liquid propellant,

(c) about 10 to about 40 wt.% of water,

(d) about 0.1 to about 30 wt.% of at least one watersoluble polar organic solvent,

(e) 0 to about 3 wt.% of at least one surfactant,

(f) 0 to about 15 wt.% of at least one pigment,

(g) 0 to about 1 wt.% of at least one pH stabilizer,

(h) 0 to about 2 wt.% of at least one antifoam agent, and

(i) 0 to about 2 wt.% of at least one plasticizer, said propellant, water and polar organic solvent being present in proportions to provide a single phase propellant-active carrier composition in which the remainder of the components of the composition are dissolved or suspended, said composition, together with any gaseous propellant present, exerting a vapor pressure within said pressurized container in the range of about 30 to about 85 psig at 70°F.

25. The composition of claim 24 wherein said polar organic solvent is at least one aliphatic monohydric alcohol of the formula: R-OH, in which R is an unsubstituted straight or branched chain alkyl group containing from 1 to 6 carbon atoms.

26. The composition of claim 24 wherein said polar organic solvent is selected from the group consisting of lower monoalkyl esters of ethylene or propylene glycol, diacetone alcohol, ketones and ester alcohols.

27. The composition of claim 24 wherein said polar organic solvent is a mixture of at least one aliphatic mono

hydric alcohol of the formula: R-OH in which R is an unsubstituted straight or branched chain alkyl group containing

1 to 6 carbon atoms and a different water-soluble polar organic solvent.

28. The composition of claim 24 wherein said pH is about

7.4 to about 7.9.

29. The composition of claim 24 wherein said continuous film is pigmented and said at least one pigment is present in said composition in an amount of about 5

to about 15 wt.

30. The composition of claims 24, 28 or 29, wherein said film-forming polymer is a water-soluble resin.

31. The composition of claims 24, 28 or 29, wherein said film-forming polymer is an emulsified water-dilutable resin.

32. The composition of claims 24, 28 or 29, wherein said film-forming polymer is selected from the group consisting of acrylic resins, alkyds, epoxylates and polyvinyl copolymers.

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(19) (CA) **CANADIAN PATENT** (12)

(54) PROPELLANT-ACTIVE CARRIER SYSTEM FOR WATER-BASED  
PAINTS

(72) Suk, Albert,  
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(73) Granted to CCL Industries Inc.  
Canada

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PROPELLANT-SOLVENT SYSTEM FOR WATER-BASED PAINTS

The present invention relates to aerosol paint compositions, and in particular to a novel propellant-solvent system therefor.

5. Aerosol paint compositions are well known but have used volatile organic solvents as the carrier for the film-forming polymer. Toxicity and flammability problems arise from the use of such organic solvents and governmental regulatory authorities are moving towards severe restrictions on the use of organic solvents in such compositions.

10 In our Canadian Patent No. 1,102,466, we have described a water-based aerosol paint formulation which satisfactorily produces a high gloss and excellent durability paint film on a substrate surface. The compositions defined therein are restricted to a narrow range of film-forming polymers.

15 It has now surprisingly been found that a novel single phase propellant-solvent composition can be utilized to form satisfactory spray-applied films based on a wide variety of water-dilutable film-forming polymers, which may be in solution form or emulsified form. The novel propellant composition of this invention consists essentially of:

- (a) about 20 to about 75% by weight of dimethyl ether,
- (b) about 10 to about 50% by weight of water,
- 25 (c) about 1 to about 30% by weight of at least one aliphatic monohydric alcohol of the formula:  $R-OH$  wherein  $R$  is an unsubstituted straight or branched chain alkyl group containing from 1 to 6 carbon atoms, and
- (d) about 1 to about 15% by weight of at least one
- 30 coalescing solvent. The proportions of the components total 100% and are sufficient to provide a single phase.

While the present invention is primarily directed to the provision of aerosol paint compositions, nevertheless the propellant-solvent composition may be used for the spray dispensing of a variety of other active components, such as, in hair sprays and deodorants.

B.

The essential components of the propellant composition of this invention are dimethyl ether, water, an aliphatic monohydric alcohol and a coalescing solvent. Dimethyl ether is a colorless, odorless, stable molar liquid with a boiling point of -25°C and a vapor pressure of 4.2 bar at 20°C.

It has been previously suggested to use this liquid as a propellant. U.S. Patent No. 1,800,156 discloses the use of dimethyl ether alone as the propellant for a large variety of materials and paints are mentioned. U.S. Patent No. 3,207,386 discloses the utilization of a combination of dimethyl ether and water as a propellant for a wide variety of products including paints, the proportions being chosen to provide a homogeneous solution of the dimethyl ether and water as the propellant and this restriction results in a composition consisting of 5 to 35% by weight of dimethyl ether and 95 to 65% by weight of water. No other solvent or propellant components are used in this prior art composition.

In the present invention, the dimethyl ether is used in a combination with water, alcohol and coalescing solvent to provide a single phase propellant-solvent composition for a water-dilutable film-forming polymer which is in aqueous solution or aqueous emulsion form, and hence the present invention involves quite a different application of the dimethyl ether in different proportions for a different purpose.

The dimethyl ether constitutes about 20 to about 75% by weight of the propellant-solvent composition, preferably about 25 to about 40% by weight, typically about 40% by weight.

Another essential component of the propellant composition of the invention is water. This component is present in a concentration of about 10 to about 50% by weight, preferably about 20 to about 35% by weight, typically about 30% by weight.

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A water-soluble lower aliphatic monohydric alcohol also is used in the composition. The monohydric alcohols used in this invention are those having the formula: R-OH wherein R is an unsubstituted straight or branched chain alkyl group containing from 1 to 6 carbon atoms. Examples of suitable monohydric alcohols are methanol, ethanol, n-propanol, iso-propanol and n-butanol, preferably ethanol or iso-propanol.

The concentration of the monohydric alcohol used in the compositions of this invention may vary widely from about 1 to about 30% by weight, preferably about 5 to about 20% by weight, typically about 15% by weight.

The fourth essential component of the composition is a water-soluble coalescing solvent. A coalescing solvent is one which assists in coalescence of the polymer into a uniform and continuous coating on the surface onto which a paint composition formulated using the composition of the invention is sprayed.

The coalescing solvent may be any water-soluble organic solvent which is also slow to evaporate. Such materials include glycols, glycol ethers, esters and certain modified alcohols and generally have a boiling point in the range of about 365° to about 572°F. (about 185° to about 300°C). Suitable solvents include lower monoalkyl ethers of ethylene or propylene glycol, such as, propylene glycol methyl ether and propylene glycol methyl ethyl ether, diacetone alcohol and ester alcohols.

The coalescing solvent is present in an amount of from about 1 to about 15% by weight, preferably about 5 to about 10% by weight, typically about 6% by weight. The combination of the monohydric alcohol and coalescing solvent is present in an amount of about 2 to about 30% by weight and, in combination with the chosen proportions of dimethyl ether and water forms a single phase composition which is suitable for dissolving or suspending the active components to be dispensed.

The propellant-solvent composition of the invention exerts a vapor pressure when packaged in a pressurized container sufficient to effect dispensing of the contents

of the container. Generally, the vapor pressure is in the range of about 30 to about 85 psig at 70°F, and preferably about 40 to about 60 psig.

The dimethyl ether constitutes the propellant component of the composition. The water provides the primary solvent and/or suspension phase for the active components, which include a film-forming polymer in the case of an aerosol paint. The aliphatic alcohol and the coalescing solvent mainly act as solvents for the propellant and the water, so that there results a substantially single phase mixture of components, which resists separation into separate liquid phases on standing. A single phase propellant-solvent composition enables active components to be readily and efficiently dispensed from the aerosol container.

The propellant-solvent composition of this invention has particular utility in the provision of aerosol water-based paint compositions. Such compositions comprise the single-phase propellant-solvent composition and a film-forming polymer dissolved and/or suspended in the propellant-solvent composition. Pigments also may be included to impart pigmentation to the sprayed film.

Such water-based aerosol paints generally comprise about 6 to about 25% by weight, preferably about 12 to about 20% by weight, of the film-forming polymers and about 92 to about 75% by weight, preferably about 88 to about 80% by weight, of propellant-solvent and, optional components, such as, pigments, surfactants, stabilizers, antifoam agents and plasticizers, as discussed in more detail below.

The propellant-solvent composition is quite versatile and is effective to permit the spray application of a wide variety of film-forming polymers onto a substrate surface to form a continuous film of excellent durability, including high flexibility retention. Depending on the nature of the polymer and the other components of the formulation, the films may be of high gloss, medium gloss, low gloss or flat.

Aerosol compositions formulated using the propellant-solvent system of the composition are non-flammable, as tested according to standard flammability tests for aerosols. For example, the spray blows out a candle.

The film-forming polymer may be any water-soluble or water-dilutable emulsified polymer which is capable of spray application to form a continuous film on a substrate surface. Many classes of polymer may be employed, including acrylic  
5 resins, alkyds, epoxy esters and polyvinyl copolymers.

Acrylic resins are thermoplastic or thermosetting polymers or copolymers of acrylic acid, methacrylic acid, esters of these acids, or acrylonitrile. Such resins may be modified by the presence of an aromatic monovinylidene  
10 compound, usually, styrene. Acrylic resins generally have molecular weights in the range of about 100,000 to about 1,000,000.

One example of an acrylic resin which is suitable for the formulation of a water-based aerosol paint composition  
15 in accordance with this invention is available from Rohm and Haas Inc., under the designation "W.L. 91". Another example is the resin available from Reichold Chemicals under the designation "90-587 Resin".

Alkyd resins are made by combining dibasic acids  
20 or their anhydrides, usually phthalic anhydride, with a polyhydric alcohol, such as glycerol. Alkyd resins often are modified by natural drying oils, such as, linseed oil, soya oil and safflower oil, in concentrations of 30 to 60% by weight.

Examples of alkyd resins which are suitable for the formulation of a water-based aerosol paint composition in accordance with this invention are available from Ashland  
25 Oil Inc., under the Trademark "AROLON" such as those designated "580" and "585".

Epoxy ester resins are resins containing a reactive epoxy group and derived from polyols and epoxy-group containing compounds. Other comonomers, such as, styrene may be copolymerized. These resins may be modified by natural drying oils in the same manner as alkyd resins.

30 An example of an epoxy resin which may be used is sold by Reichold Chemicals under the designation "38-690".

Polyvinyl copolymers are formed by copolymerizing vinyl chloride or vinyl acetate with copolymerizable monomers. One example of such a material suitable for the

formulation of a water-based aerosol paint composition in accordance with this invention is available from B.F.

Goodrich Company under the designation "514H".

Mixtures of two or more resins or resin types may be used in the aerosol water-based paint formulations of this invention.

As mentioned above, an optional component which may be present in the paint composition is a pigment for pigmentation of the film formed on spraying the composition onto a substrate surface. When employed, up to about 15% by weight of the total composition of the pigment may be used, preferably about 5 to about 15% by weight of pigment.

When such pigment is present, the quantity of polymer used is generally towards the lower end of the range recited above. When such pigment is omitted and a clear film is required, then quantities of polymer towards the higher end of the range are used.

The presence of the pigment usually requires the presence of added surfactant to ensure suspension of the pigment in the liquid vehicle. Some surfactant may be present with the film-forming polymer, if the latter is in emulsion form, but the quantity involved usually is insufficient to effect suitable suspension of added pigment.

The overall quantity of surfactant present in the composition should be sufficient to maintain solids in suspension and usually varies up to about 3% by weight of the composition.

A pH stabilizer may also be present in the composition to provide an overall pH value greater than about 7.2 and up to about 10 to assist in inhibition of corrosion of the conventional pressurized metal container in which the paint composition is located for spray application. Suitable pH stabilizer materials include morpholine, ammonia and triethanolamine. This component may be present in an amount of up to about 2% by weight of the total composition.

An antifoam agent may be included to alter the surface tension of the composition to permit ready release of dissolved gases upon spraying of the composition onto the substrate surface and to counteract the detergent

effect of the surfactants present in the composition. A non-ionic blend of mineral oils and silica derivatives has been found to be suitable for use for defoaming. When an antifoam agent is present, quantities up to about 2% by weight of the total composition may be used, preferably about 0.4% by weight.

Another component which may be added to the aerosol paint composition is a plasticizer to promote flexibility. Any one of a wide range of plasticizers may be used, for example, dioctyl phthalate. The plasticizer may be present in an amount of up to about 2% by weight of the total composition, preferably about 1% by weight.

The aerosol water-based paint compositions provided in accordance with this invention, therefore, are characterized by a pH of about 7.2 to about 10, preferably about 7.4 to about 7.9, and consist essentially of:

- about 6 to about 25 wt.% of at least one water-dilutable film-forming polymer (calculated as the non-volatile content thereof),
- about 20 to about 60 wt.% of dimethyl ether,
- about 10 to about 40 wt.% of water,
- about 1 to about 20 wt.% of at least one aliphatic monohydric alcohol containing from 1 to 6 carbon atoms,
- about 1 to about 10 wt.% of at least one coalescing solvent,
- 0 to about 3 wt.% of at least one surfactant,
- 0 to about 15 wt.% of at least one pigment,
- 0 to about 1 wt.% of at least one pH stabilizer,
- 0 to about 2 wt.% of at least one antifoam agent, and
- 0 to about 2 wt.% of at least one plasticizer.

The dimethyl ether, water, monohydric alcohol and coalescing solvent are present in the composition in proportions to provide a single phase solvent-propellant system in which the remainder of the components are dissolved or suspended.

The aerosol water-based paint composition, which is formulated as described above using the propellant-solvent system of the invention, may be sprayed onto a substrate

surface without foaming occurring and the pigmented or unpigmented continuous film touch dries rapidly, usually in about 15 to 30 minutes, and exhibits complete water resistance in an acceptable period of time, usually in  
 5 about 3 to 5 hours.

The invention is illustrated by the following

Examples:

Examples 1 to 13

A number of aerosol water-based paint formulations  
 10 were prepared using various film-forming polymers and pigments and packaged in aerosol cans. The films were sprayed onto substrate surfaces. In each case, a continuous film was formed which was dry to the touch in 30 minutes, exhibited water resistance within 3 hours of application and  
 15 had a salt spray resistance (ASTM test B117) of more than 50 hours.

The following are the formulations:

Example 1 - Red oxide primer - Mixed acrylic-epoxy resin

	Component	wt. %
20	WL91 Resin (1)	3.6
	38-690 Resin (2)	14.5
	Water	13.25
	Isopropyl alcohol	15.0
	Butylcellosolve	4.0
25	Texanol *	0.7
	Red Oxide pigment	5.0
	Driers - Mn 6%, Co 6%	0.25
	L475 (3)	0.2
	Triethanolamine	1.0
30	Dioctyl phthalate	0.5
	OK412 (4)	2.0
	Dimethyl ether	40.0
	Total	100.0

Notes: (1) Acrylic resin made by Rohm and Haas;  
 35 (2) Epoxy resin made by Reichold Chemicals;  
 (3) Defoamer - Dow Chemical;  
 (4) Silica flattening agent.

\* - Trademark



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Example 2 - Blue - Acrylic resin

	Component	wt. %
	WL91 Resin	22.0
	Water	10.0
5	Isopropyl alcohol	15.0
	Butylcellosolve	4.5
	Texanol	0.7
	White pigment	2.3
	Blue pigment	4.6
10	L475	0.2
	5% NH <sub>4</sub> OH	0.2
	Diethyl phthalate	0.2
	Dimethyl ether	40.0
	Total	100.0

15 Examples 3 to 7

Formulations similar to Example 2 were prepared using WL91 as the resin with differing pigments, as follows:

	Example 3	-	White
	Example 4	-	Red
20	Example 5	-	Green
	Example 6	-	Black
	Example 7	-	Orange

Example 8 - Flat black - Acrylic resin

	Component	wt. %
25	WL91 Resin	21.8
	Water	9.5
	Isopropyl alcohol	15.0
	Butylcellosolve	4.5
	Texanol	0.7
30	Black pigment	5.0
	L475	0.4
	5% NH <sub>4</sub> OH	0.5
	Diethyl phthalate	0.5
	OK412	2.0
35	Triton X-45 (1)	0.1
	Dimethyl ether	40.0
	Total	100.0

Note: (1) Rohm & Haas non-ionic surfactant

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## Example 9 - Fire orange fluorescent - Acrylic resin

	Component	wt. %
	90-587 Resin <sup>(1)</sup>	15.0
	Water	12.7
5	Isopropyl alcohol	15.0
	Butylcellosolve	4.0
	Fire orange pigment	11.7
	L475	0.2
	NH <sub>4</sub> OH (conc.)	1.3
10	Triton X 405 <sup>(2)</sup>	0.1
	Dimethyl ether	40.0
	Total	100.0

Notes: (1) Reichold Chemicals acrylic resin;  
(2) Rohm & Haas nonionic surfactant.

## 15 Example 10 - Red oxide primer - Alkyd-Acrylic resin mixture

	Component	wt. %
	WL91 Resin	18.00
	Arolon 585 <sup>(1)</sup>	5.75
	Water	15.03
20	Isopropyl alcohol	15.00
	Butylcellosolve	4.50
	Texanol	0.70
	Red oxide pigment	8.00
	L475	0.40
25	5% NH <sub>4</sub> OH	0.02
	Diocetyl phthalate	0.50
	OK412	2.00
	Triton X100	0.10
	Dimethyl ether	30.00
30	Total	100.00

Note: (1) Ashland Oil alkyd resin

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Example 11 - Blue - Alkyd resin

	Component	wt. %
	Arolon 580 (1)	27.0
	Arolon 585 (2)	10.2
5	Water	8.8
	Isopropyl alcohol	7.7
	Butylcellosolve	2.3
	Blue pigment	2.1
	White pigment	1.1
10	Drier	0.3
	L475	0.2
	5% NH <sub>4</sub> OH	0.1
	Triton X100	0.3
	Dimethyl ether	40.0
15	Total	100.0

Note: (1) and (2) Alkyd resins made by Ashland Oil

Example 12 - Red Oxide primer - Epoxy resin

In the formulation of Example 1, the WL91 resin was replaced wholly by an increased amount of 38-690 resin to provide 18.1 wt.% of such resin in the resulting formulation.

Example 13 - clear - PVC resin

	Component	wt. %
	415H Resin (1)	25.0
	Water	24.7
25	Isopropyl alcohol	15.0
	Butylcellosolve	5.0
	L475	0.2
	5% Ammonia	0.1
	Dimethyl ether	30.0
30	Total	100.0

Note: (1) Carboxy modified polyvinyl chloride terpolymer made by B.F. Goodrich.

SUMMARY OF DISCLOSURE

In summary of this disclosure, the present invention, therefore, provides a novel propellant-solvent composition useful for the spray application of water-based paints to substrate surfaces. Modifications are possible within the scope of this invention.

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SUPPLEMENTARY DISCLOSURE

In the principal disclosure, there is described a single phase propellant-solvent (or active carrier) composition consisting essentially of:

- 5 (a) about 20 to about 75% by weight of dimethyl ether;  
(b) about 10 to about 50% by weight of water;  
(c) about 1 to about 30% by weight of at least one aliphatic monohydric alcohol of the formula: R-OH wherein R is an unsubstituted straight or branched chain alkyl group  
10 containing from 1 to 6 carbon atoms;  
(d) about 1 to about 15% by weight of at least one water-soluble coalescing solvent, the composition exerting a vapor pressure within the pressurized container in the range of about 30 to about 85 psig at 70°F.

15 It has now been found, in accordance with this Supplementary Disclosure that, although it is preferred for the alcohol and coalescing solvent to be present in the recited proportions and to use dimethyl ether as the sole propellant, there may be provided a single phase propellant-  
20 active carrier composition consisting essentially of:

- (a) about 20 to about 75% by weight of a propellant comprising dimethyl ether and from 0 to about 50% by weight of the dimethyl ether of another liquid propellant;  
(b) about 10 to about 50% by weight of water; and  
25 (c) about 0.1 to about 45% by weight of at least one water-soluble polar organic solvent. The proportions of the components total 100% and are sufficient to provide a single phase. The composition, together with auxiliary gaseous propellants, if present, exerts a vapor pressure in a pressurized  
30 aerosol container in the range of about 30 to about 85 psig at 70°F, preferably about 40 to about 60 psig.

Suitable liquid propellants which may be used along with the dimethyl ether are aliphatic hydrocarbons and fluorinated hydrocarbons. Suitable auxiliary gaseous phase  
35 propellants which may be used along with the dimethyl ether, with or without the other liquid propellants, are nitrogen, carbon dioxide and nitrous oxide.

Among the polar organic solvents which may be used are alcohols, glycol ethers, esters, ketones and certain

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modified alcohols, examples of which are specified in the principal disclosure.

The propellant-active carrier composition may be used to provide water-based paint compositions. Such compositions are preferably substantially non-flammable, as tested according to standard flammability tests for aerosols. Suitable water-dilutable film-forming polymers which may be formulated with the propellant-active carrier composition are described in detail in the principal disclosure.

10 In accordance with this supplementary disclosure, the aerosol water-based paint compositions are characterized by a pH of about 7.2 to about 10, preferably about 7.4 to about 7.9, and consist essentially of:

about 6 to about 25 wt.% of at least one water-dilutable film-forming polymer (calculated as the non-volatile content thereof),

about 20 to about 60 wt.% of a propellant comprising dimethyl ether and 0 to about 50% by weight of the dimethyl ether of another liquid propellant,

20 about 10 to about 40 wt.% of water,

about 0.1 to about 30 wt.% of at least one water-soluble polar organic solvent,

0 to about 3 wt.% of at least one surfactant,

0 to about 15 wt.% of at least one pigment,

25 0 to about 1 wt.% of at least one pH stabilizer,

0 to about 2 wt.% of at least one antifoam agent,,

and

0 to about 2 wt.% of at least one plasticizer.

The propellant, water and polar solvent are present in the composition in proportions to provide a single phase propellant-active carrier system in the remainder of the components are dissolved or suspended. Suitable surfactants, pigments, pH stabilizers, antifoam agents and plasticizers are described in detail in the principal disclosure.

35 The invention is illustrated further by the following additional Example:

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Example 14

	<u>Component</u>	<u>wt. %</u>
	Styrenated epoxy ester (1)	13.0
	Water	31.0
5	White tinter (2)	13.5
	Driers (Cu naphthenate 6%, Mn naphthenate 6%)	0.2
	Active 8	0.1
	Concentrated ammonia	1.0
10	Byk 020 (defoamer)	0.2
	Byk 351 (flow agent)	1.0
	Dimethyl ether	40.0
	Total	100.00

Notes: (1) 453V8 by C.P.V. - comprises 70% solids and 30%

15 Butylcellosolve

(2) Tinter comprises:	Styrenated epoxy ester	23.5
	Concentrated ammonia	1.5
	Water	15.0
	TiO <sub>2</sub>	60.0
		<u>100.0</u>

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The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A single phase liquid propellant-solvent composition suitable for use in the spray application of an active ingredient from a pressurized container onto a substrate surface, consisting essentially of:
  - (a) about 20 to about 75% by weight of dimethyl ether;
  - (b) about 10 to about 50% by weight of water;
  - (c) about 1 to about 30% by weight of at least one aliphatic monohydric alcohol of the formula:  $R-OH$  wherein  $R$  is an unsubstituted straight or branched chain alkyl group containing from 1 to 6 carbon atoms, and
  - (d) about 1 to about 15% by weight of at least one coalescing solvent,said composition exerting a vapor pressure within said pressurized container in the range of about 30 to about 85 psig at 70°F.
2. The composition of claim 1 wherein said monohydric alcohol is ethanol or isopropanol.
3. The composition of claim 1 wherein said coalescing solvent is selected from the group consisting of lower monoalkyl esters of ethylene or propylene glycol, diacetone alcohol and ester alcohols.
4. A water-based aerosol paint composition suitable for spray application from a pressurized container to a substrate surface and air drying to a continuous film thereon, said composition comprising:
  - (a) about 6 to about 25% by weight of at least one water-dilutable film-forming polymer, and
  - (b) about 92 to about 75% by weight of the solvent-propellant composition of claim 1.
5. The composition of claim 4 wherein said film-forming polymer is present in an amount of from about 12 to about 20% by weight and said solvent-propellant composition is present in an amount of about 88 to about 80% by weight.
6. An aerosol water-based paint composition having a pH of about 7.2 to about 10 and suitable for spray application to a substrate surface and air drying to a continuous film thereon, consisting essentially of:

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- A. (a) about 6 to about 25 wt.% of at least one water-dilutable film-forming polymer,  
(b) about 20 to about 60 wt.% of dimethyl ether,  
(c) about 10 to about 40 wt.% of water,  
(d) about 1 to about 20 wt.% of at least one aliphatic monohydric alcohol of the formula: R-OH wherein R is an unsubstituted straight or branched chain alkyl group containing from 1 to 6 carbon atoms,  
(e) about 1 to about 10 wt.% of at least one coalescing solvent,  
(f) 0 to about 3 wt.% of at least one surfactant,  
(g) 0 to about 15 wt.% of at least one pigment,  
(h) 0 to about 1 wt.% of at least one pH stabilizer,  
(i) 0 to about 2 wt.% of at least one antifoam agent,  
and  
(j) 0 to about 2 wt.% of at least one plasticizer,  
said dimethyl ether, water, monohydric alcohol and coalescing solvent being present in proportions to provide a single phase solvent-propellant composition in which the remainder of the components of the composition are dissolved or suspended, said composition exerting a vapor pressure within said pressurized container in the range of about 30 to about 85 psig at 70°F.

- B. 7. The composition of claim 6 wherein said dimethyl ether is present in an amount of about <sup>20</sup><sub>5</sub> to about <sup>40</sup><sub>20</sub> % by weight.  
8. The composition of claim 6 wherein said water is present in an amount of about 20 to about 35 % by weight.  
9. The composition of claim 6 wherein said monohydric alcohol is present in an amount of about 5 to about 20 % by weight.  
10. The composition of claim 6 wherein said coalescing solvent is present in an amount of about 5 to about 10 % by weight.  
11. The composition of claim 6 wherein:  
said dimethyl ether is present in an amount of about 20 to about 40 % by weight,  
said water is present in an amount of about 20 to



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- A** about 35 % by weight,  
said monohydric alcohol is present in an amount of  
about 5 to about 20 % by weight, and  
said coalescing solvent is present in an amount of  
about 5 to about 10% by weight.
12. The composition of claim 6 wherein said pH is about  
7.4 to about 7.9.
13. The composition of claim 6 wherein said continuous  
film is pigmented and said at least one pigment is present  
in said composition in an amount of about 5 to about 15 wt.%.  
**B** 14. The composition of claim 6, 11, ~~12~~ or 13 wherein said  
film-forming polymer is a water-soluble resin which is  
dissolved in said solvent-propellant composition.
15. The composition of claim 6, 11, ~~12~~ or 13 wherein said  
film-forming polymer is a water-dilutable resin.
16. The composition of claim 6, 11, ~~12~~ or 13 wherein said  
film-forming polymer is selected from the group consisting  
of acrylic resins, alkyds, epoxy esters and polyvinyl  
copolymers.
17. The composition of claim 6 or 11 wherein said  
monohydric alcohol is ethanol or isopropanol.

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CLAIMS SUPPORTED BY SUPPLEMENTARY DISCLOSURE

18. A single phase liquid propellant-active carrier composition suitable for the spray application of an active ingredient from a pressurized container onto a substrate surface, consisting essentially of:

(a) about 20 to about 75% by weight of a propellant comprising dimethyl ether and from 0 to about 50% by weight of the dimethyl ether of another liquid propellant;

(b) about 10 to about 50% by weight of water; and

(c) about 0.1 to about 45% by weight of at least one polar water-soluble organic solvent,

said propellant, water and polar organic solvent totalling 100% by weight and said composition, together with any gaseous propellant present, exerting a vapor pressure within said pressurized container in the range of about 30 to about 85 psig at 70°F.

19. The composition of claim 18 wherein said polar organic solvent comprises at least one aliphatic monohydric alcohol of the formula: R-OH in which R is an unsubstituted straight or branched chain alkyl group containing from 1 to 6 carbon atoms.

20. The composition of claim 18 wherein said polar organic solvent is selected from the group consisting of lower mono-alkyl esters of ethylene or propylene glycol, diacetone alcohol, ketones and ester alcohols.

21. The composition of claim 18 wherein said polar organic solvent comprises a mixture of at least one aliphatic monohydric alcohol of the formula: R-OH in which R is an unsubstituted straight or branched chain alkyl group containing from 1 to 6 carbon atoms and a different water-soluble polar organic solvent.

22. A water-based aerosol paint composition suitable for spray application from a pressurized container to a substrate surface and air drying to a continuous film thereon, said composition comprising:

(a) about 6 to about 25% by weight of at least one water-dilutable film-forming polymer, and

(b) about 92 to about 75% by weight of the propellant-active carrier composition of claim 18.

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23. The composition of claim 22 wherein said film-forming polymer is present in an amount of from about 12 to about 20% by weight and said propellant-active carrier composition is present in an amount of about 88 to about 80% by weight.

24. An aerosol water-based composition having a pH of about 7.2 to 10 and suitable for spray application to a substrate surface and air drying to a continuous film thereon, consisting essentially of:

- (a) about 6 to about 25 wt.% of at least one water-dilutable film-forming polymer,
  - (b) about 20 to about 60 wt.% of a propellant comprising dimethyl ether and from 0 to about 50 wt.% of the dimethyl ether of another liquid propellant,
  - (c) about 10 to about 40 wt.% of water,
  - (d) about 0.1 to about 30 wt.% of at least one water-soluble polar organic solvent,
  - (e) 0 to about 3 wt.% of at least one surfactant,
  - (f) 0 to about 15 wt.% of at least one pigment,
  - (g) 0 to about 1 wt.% of at least one pH stabilizer,
  - (h) 0 to about 2 wt.% of at least one antifoam agent,
- and

(i) 0 to about 2 wt.% of at least one plasticizer, said propellant, water and polar organic solvent being present in proportions to provide a single phase propellant-active carrier composition in which the remainder of the components of the composition are dissolved or suspended, said composition, together with any gaseous propellant present, exerting a vapor pressure within said pressurized container in the range of about 30 to about 85 psig at 70°F.

25. The composition of claim 24 wherein said polar organic solvent is at least one aliphatic monohydric alcohol of the formula:  $R-OH$ , in which R is an unsubstituted straight or branched chain alkyl group containing from 1 to 6 carbon atoms.

26. The composition of claim 24 wherein said polar organic solvent is selected from the group consisting of lower monoalkyl esters of ethylene or propylene glycol, diacetone alcohol, ketones and ester alcohols.

27. The composition of claim 24 wherein said polar organic solvent is a mixture of at least one aliphatic mono-

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hydric alcohol of the formula: R-OH in which R is an unsubstituted straight or branched chain alkyl group containing 1 to 6 carbon atoms and a different water-soluble polar organic solvent.

28. The composition of claim 24 wherein said pH is about 7.4 to about 7.9.

29. The composition of claim 24 wherein said continuous film is pigmented and said at least one pigment is present in said composition in an amount of about 5 to about 15 wt. %.

30. The composition of claims 24, 28 or 29, wherein said film-forming polymer is a water-soluble resin.

31. The composition of claims 24, 28 or 29, wherein said film-forming polymer is an emulsified water-dilutable resin.

32. The composition of claims 24, 28 or 29, wherein said film-forming polymer is selected from the group consisting of acrylic resins, alkyds, epoxylates and polyvinyl copolymers.

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